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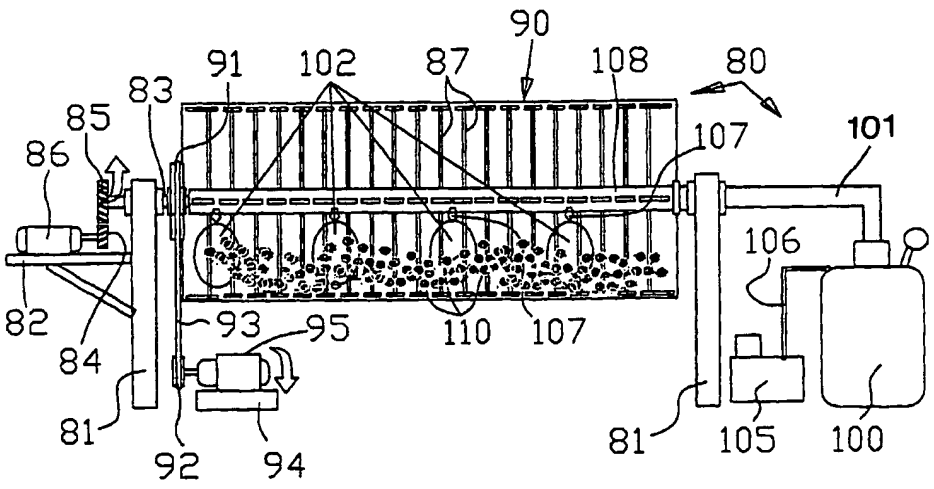
(54) Title: PROCESS AND MACHINERY FOR PRODUCING AND PACKAGING INDIVIDUAL PORTIONS CONTAINING FLAVOURINGS AND AROMAS TO IMPROVE BEVERAGES AND FOOD IN GENERAL BY ADDING THEM AT THE TIME OF CONSUMPTION




(57) Abstract: Process and machinery for the production (80) and packaging of soluble individual portions, the purpose of which is to improve beverages and food in general, both cooked and raw, at the moment of their consumption, comprising additive components in granules, for spicing, flavouring, supplements in general, supporting components such as sweeteners, salts, fibres, dehydrated and free-dried foods, and means of protection for the active principles in the additives by encapsulation in capsules (110) and by packaging said individual portions in flattened packets from which air has been expelled.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Process and machinery for producing and packaging individual portions containing flavourings and aromas to improve beverages and food in general by adding them at the time of consumption**

The invention concerns means for improving beverages and food in general by the addition of aromas and flavourings at the moment of consumption.

At the present time processes for adding flavourings, essences, colourings, energisers, vitamins, pain-easers, saline substances and other supplements to beverages and foods for their improvement present considerable problems.

For example, blowing a mass of sugar into an aqueous, alcoholic or oily solution in a mixer may destroy the additive's active principles as, lying on the surface of the sugar crystals, it is exposed to air present in the packet containing an individual portion.

Alcoholic aromas in particular evaporate on contact with air and those contained in fruit juices will oxidate.

Additives added to supporting materials, for example salts, malt dextrins, lactose, various kinds of fibres and spices, quickly deteriorate on exposure to air and, in the case of spices, due to

deteriorate on exposure to air and, in the case of spices, due to decomposition of molecules favoured by catalysis when in the presence of heavy metals.

To sum up, the problems relating to additives concern:

- the physical form of the components;
- their densities;
- the need for protection against oxidation and volatility;
- fixing of the active principles, at temperatures of the beverage even as high as 70-80°C;
- separating out of components due to packaging and transport stresses, or to unsatisfactory conditions of storage;
- chemical interaction;
- formation of lumps in the beverage where substances such as vanilla, cinnamon or cocoa for example, are used;
- breakage of the granules of additives by friction against crystals of carbohydrates;
- excessively high costs and a short commercial life.

The invention here described solves these problems conveniently and economically as will now be explained.

Subject of the invention is a process and machinery for production and packaging of soluble individual portions, for improving cooked or raw foods in general, added at the moment of consumption.

These individual portions comprise additive components in granules for spicing, flavouring, colouring, energising, vitiminising, easing of pain, providing salt substances and supplements in general, supporting components and means for protecting the active principles of said additives.

The supporting components are sweeteners, salts, fibres, dehydrated foods and freeze-dried foods, in granules, physically homogeneous with the additives in their granulation, size and density.

The sweeteners may be carbohydrates and may be associated to products derived from the Stevia Rebaudiana Bertoni plant or to others derived from liquorice root.

The sweeteners may also be artificial.

Each individual portion weighs between two and fifteen grams if the sweeteners are natural and calorific, and up to five grams if non-calorific.

The additives are protected by encapsulating their particles of active principles.

In one type of execution the particles of active principles of the additives are encapsulated by incorporating them, finely homogenized, in a mixture of carbohydrates whose molecular structures have been made amorphous, followed by extrusion of the compound so obtained.

The cycle for encapsulating the particles of active principles of the additives preferably comprises the following stages:

- introduction into a boiler of a crystalline mixture of carbohydrates in granules, chosen from among those whose temperature of transition – that needed for transforming the carbohydrates from the crystalline to the amorphous state – is as low and as even as possible;
- transformation of the crystalline mixture of carbohydrates into an amorphous mass by heating and addition of plasticizing liquids;
- addition of finely dispersed additives through atomizing nozzles;
- rapid cooling of the compound;
- introduction of the compound into the chamber of an extruder;
- extrusion of the compound;
- cutting the extruded threads into sticks of the same length as those of the carbohydrate granules used;
- washing of the sticks with a nebulizer;
- drying of the sticks to a moisture level of 2-5%.

During extrusion the capsule of additive is shaped with sharp edges these being maintained by suitable packaging.

In another type of execution encapsulation of the particles of the active principles of the additives is done by centrifugation of a compound comprising water, liquid fractions of the additives and a mixture of soluble substances, excess moisture being eliminated by a draught of warm air.

The soluble substances in the mixture may consist of carbohydrates, mainly starches and glucides, or of jellies or gum arabic.

In one type of execution encapsulation of the particles of the active principles of the additives is done by formation of a soluble protective shell around the granules of carbohydrates impregnated by atomization with the additive.

The substances known as liposoms are phospholipids comprising a mixture of phosphatidylcoline (PC) and of phosphatidylethanolamile (PE) supported in malt dextrin.

The protective shell comprises natural or artificial sweeteners, or a mixture thereof.

In another type of execution encapsulation of the particles of the active principles of the additives is done dry. using liposoms of lecithin of soya, and includes saturation, at room temperature, of a first fluid mixture of additives, liposoms and carbohydrates mainly malt dextrin, then adding to said fluid mixture a second dry mixture of carbohydrates, mainly dextrose and starches, in a machine that comprises a horizontal cylindrical container.

Inside said container is a shaft with orthogonal blades laid along its geometrical axis.

Said cylindrical container rotates slowly round the shaft at a speed of a few turns per minute, while the shaft itself rotates faster, in the opposite direction.

The encapsulation sequence is preferably the following:

- the first fluid mixture is put into the container;
- the second mixture is added dry, by atomization, to the moving fluid mixture;
- the blades continuously grind up the lumps, which tend to form in the compound of the two mixtures, until, partly due to rotation and to reciprocal friction among the lumps, macrocapsules of liposoms are formed gradually becoming spherical in shape;
- the macrocapsules are dried in a draught of warm air;
- macrocapsule size is calibrated by a seive.

The active principles of the additives are given further protection by packaging.

If the individual portion is in granular form, packaging consists of a sealed packet.

Packaging in a sealed packet is preferably done by a specific packaging machine in which the filled packet is flattened by expelling any air inside it through channels which are subsequently closed.

The machine, preferably able to package several packets at once, associating them at two sides of each packet to form a strip, comprises:

- a series of aligned batches of the product subject of the process;
- a pair of opposed heated rollers for longitudinal welding of the packets leaving open crosswise channels for air to escape;
- a pair of opposed heated rollers for crosswise welding and for cutting the lower edge of the packet during the filling stage, and of the upper edge of the preceding packet;
- a pair of shafts with longitudinal circular blades for separating the strips of aligned packets;
- a pair of opposed pressure rollers for flattening the filled packets, expelling the air inside them;

- a pair of opposed heated rollers for longitudinally welding the seal of the crosswise channels through which the air inside the packet has been expelled.

The packages preferably present forms, colouring, wordings, indications according to the components of the individual portion.

A special type of blister package comprises the individual portion inside a small disposable cup.

Another special type of package is obtained by placing the individual portion in a tube with tear-off lid complete with tongue, the base of which is shaped to function as a spoon.

If the individual portion consists of a lump of sugar, packaging is done by wrapping it in a piece of suitable material, the edges at one end being folded over and those at the other end twisted to form a twist, or else the edges at both ends are made to form two twists.

For greater protection the material used for packaging, and therefore for the packet as well, may be of three layers: an inner layer of polythene, an intermediate one of non-elastic metal of micrometric thickness and an outer layer of paper.

The processes described may also serve for special applications.

One advantageous application consists in encapsulating additives intended to reach the stomach, in microcapsules of micro or nanometric dimensions having a case soluble in an acid pH, enclosed in a larger capsule, with a shell soluble in the beverages, that comprises the additive included to improve them, so that the larger capsule and the additive it contains dissolve in the beverage while the microcapsules, dissolving on contact with the gastric juices, free the active principles of the additives they contain.

The invention offers evident advantages.

Innumerable additives, possibly also included in individual packets of artificial sweetener, are made available to the consumer who is thereby offered a wide variety of aromas and flavours at a low cost.

It thus becomes possible to offer unusual or immaginatively mixed flavours at an almost negligible commercial risk.

Encapsulation obtained by atomizing granules of additives with a soluble protective barrier immediately dried in hot air, essentially consists in converting the liquid fraction of the additive to a dry state and enclosing it in a soluble case.

This substance perfectly preserves the aroma and flavour as the additive, contained in the former, cannot interact with external agents, while its active principles, when brought in contact with breverages and food, can be completely given off.

In the case of aromas extracted with alcohol for example, the alcohol is separated by slightly heating it, after which the aromatic component, deprived of alcohol, is immediately encapsulated by the inert atomized substance and sprayed into the boiler.

In this way a substance is obtained with an alcoholic taste but containing no alcohol.

Encapsulation is the only means of supporting alcoholic aromas having a percentage of alcohol as high as 20-30%.

The process of dry encapsulation is very important as it avoids altering the aroma or flavour of precious essences when they are supported by liquid sugary syrups.

It is well known that in the case of diets, low in calories and salt, there is a tendency to cut out fatty condiments and salt and therefore the bouillon cubes containing monosodium glutamate, replacing them with spices, so creating problems of flavour and appetitivity.

In particular it is also known that monosodium glutamate may cause side effects such as headache, nausea and giddiness.

These problems are solved by including an additive of an aroma or flavour used in cookery in an individual portion with non-assimilatable polysaccharide carbohydrates such as fibres or some other low-calory product.

Aromas and flavours like truffles, blue cheese, onions and many others can thus give a personal touch to an ordinary family dish such as pasta, brazed beef and many others.

Fresh products such as milk, soft cheese, yoghurt, water can also be flavoured as fancy dictates, or an alcoholic flavour be obtained without alcohol, or coffee without caffein.

For example, coffee or milk can be sweetened by adding an individual portion containing a capsule of additive that dissolves in the beverage and a pain-easing capsule that dissolves in an acid pH environment such as the gastric juices, in this way enabling the pain-easing active principle to go straight into the stomach.

The availability of a wide variety of aromas and flavours in small quantities, for use in the home at a low price, makes the product comparable to the ordinary bouillon cube, but sweet instead of salt.

Even a glass of water obtained from a tap fitted with a domestic purifying device can be made more attractive without resorting to the addition of syrups and the like.

The individual portion and spoon combined can solve a problem of considerable importance, that of availability not only of the beverage but also the means for stirring it after putting in the additive.

To sum up the above advantages:

the following processes of encapsulation, namely

- extrusion of an amorphous mixture of one or more carbohydrates and of one or more additives;
- atomization in a mixer of granules of additives with concentrated solutions of sugary syrups dried in the air;
- atomization with carbohydrates of additive-impregnated sugar granules;
- the use of liposoms of lecithin of soya,

by stabilization in the packets of the additive granules in relation to those of the sweetener by giving the former granules a sharp-edged shape, flattening the packets and completely expelling the air,

by packaging the individual portions using multi-layer sheets comprising paper, metal and polythene,

a longer life, even up to four years can be conferred on the active principles of aroma-giving, flavouring, energising, vitaminising, pain-easing additives together with those of other diet supplements, prolonging their period of life at present limited to months.

Commercial importance of additives can be greatly enhanced, compared with the lack of proper consideration now given them.

Characteristics and purposes of the disclosure will be made still clearer by the following examples of its execution illustrated by diagrammatically drawn figures.

Fig. 1 Additive encapsulating machine comprising dry extrusion, initial stage, longitudinal section with detail of the perforated plate.

Fig. 2 Machine as above, at the end of extrusion.

Fig. 3 Washing of extruded material, longitudinal section.

Fig. 4 An extruded capsule, perspective view.

Fig. 5 Detail of an individual portion comprising additives encapsulated by the extruder and granules of sweetener.

Fig. 6 Detail of a capsule made by encapsulating a granule of additive.

Fig. 7 Detail of a capsule made by encapsulating several additives.

Fig. 8 Detail of an irregularly shaped capsule made by encapsulating a granule of carbohydrates.

Fig. 9 Machine for encapsulating additives by means of liposoms with lump-breaker blades, longitudinal section.

Fig. 10 Detail of the above blades at the start of encapsulation.

Fig. 11 As above, during encapsulation.

Fig. 12 As above, on completion of encapsulation.

Fig. 13 Detail of a capsule comprising the liposoms.

Fig. 14 Enlarged view of a granular liposom.

Fig. 15 The components of a packet making up an individual portion

Fig. 16 Machine for packaging portions in packets, front view

Fig. 17 Multiple batcher, a section view.

Fig. 18 Pair of rollers for the first longitudinal welds of packets creating air-expelling channels, associated to a pair of rollers for crosswise welds and for cutting the lower edge of packets during the filling stage, and the upper edge when the packet is filled.

Fig. 19 A strip of four sealed packets, perspective view.

Fig. 20 A strip of two sealed packets, perspective view.

Fig. 21 A strip of six sealed packets, perspective view.

Fig. 22 A packet for an individual portion after the first weld showing an air-expelling channel, front view.

Fig. 23 The packet in fig. 22 after crosswise cut and weld, front view

Fig. 24 The packet in fig. 23 when sealed, front view.

Fig. 25 A rectangular packet, front view.

Fig. 26 A square packet, front view.

Fig. 27 Blister packaging of several packets together, front view.

Fig. 28 As above, side view.

Fig. 29 Individual portion packaged in a cup, front view.

Fig. 30 As above, seen from on top.

Fig. 31 As above, a cross section.

Fig. 32 Blister package with several cup-packed portions, front view.

Fig. 33 A packaged lump with one twisted end, perspective view.

Fig. 34 A packaged lump with two twisted ends, perspective view.

Fig. 35 Blister-packaged individual portion in a tube, front view.

Fig. 36 The tube, front view.

Fig. 37 As above, seen from on top.

Fig. 38 The tube when the portion is being poured into a cup, front view.

Fig. 39 As above showing the tube being used to mix the drink, front view.

Purpose of the machine 10 is to make possible a process of encapsulation by dry extrusion of the additives used to make up the product, in the individual portions subject of the invention.

Said machine 10 comprises a base 11, compression chamber 12 with loading hopper 13, a piston 14 operated by means of a worm screw 15, the handwheel 16, extrusion plate 17 with holes 18 in it and the conveyor belt 20.

The piston can obviously be motor-operated if desired.

As shown in the detail, the holes 18 in the extrusion plate 17 are star-shaped with sharp edges 19.

A crystalline mixture is put into a boiler, not shown for simplicity, said mixture consisting of carbohydrates such as malt dextrin, choosing them from among those whose temperature of molecular transition – namely the temperature at which their state passes from crystalline to amorphous – is as low and as even as possible.

If needed, substances may be added, to help stabilize the mixture in the amorphous state, and water.

The mass so created is then heated, but not beyond said temperature of molecular transition, and a solution or mixture of the additives is added to it, using atomizing nozzles, forming a compound 25 consisting of an extremely fine and homogeneous mixture of the above mass with the additives.

If the additives contain substances insoluble in water, an emulsion is created in which the wetting-resistant portion will be dispersed into minute particles by a homogeniser.

Dispersion of the mass into minute particles is maintained by emulsifying substances, such as lecithin of soya for example.

The compound so obtained is cooled quickly to prevent the carbohydrate molecules from returning to their natural state.

Once cooled, the compound 25, which at that point appears like an amorphous plastic and glassy mass containing additives at the established concentration, is placed in the extrusion chamber 12.

By turning the handwheel 16, or by an electric motor not shown in the drawings, the compound 25 is extruded into threads 30 (Figure 2), whose cross section will of course be the same as that of the holes 18 in the extrusion plate 17.

Said threads 30 are cut into short sticks 32 (see Figure 3) of a length substantially that of the carbohydrate granules, as supplied by manufacturers, to be used to complete the individual portions subject of the invention.

The conveyor belt 20 then carries said sticks 32 along to the washing system 40, fitted with atomizers 41, where particles 33 of additive, left clinging to the outside of the sticks, are cleaned off.

The sticks 32 are then dried after which their residual moisture will be 2-5%.

After washing and drying, the sticks constitute the capsules 35 (Figure 4) with sharp edges 36 on the outside of the star-shaped section and a few particles 37 of additive spread throughout them.

Purpose of said sharp edges 36 is to hinder movement inside the package of sweetened portion with additives subject of the invention.

This phenomenon is more clearly seen in Figure 5 where the components of the individual portion, the capsule 35 and the particles of sweetener 37 are diagrammatically drawn.

It will there be seen that, with its sharp points 36, the capsule tends to attach itself to the particles 37 of sweetener.

The capsule 50 in Figure 6 is made by nebulizing the granules of additive, as received from the industrial supplier, moved about in a mixer fitted with an atomizer, in a highly concentrated solution of carbohydrate syrup to render their granulation, size and density homogeneous with the granules of the supporting components.

The mixture is then immediately dried in a draught of air.

Figure 6 shows a capsule 50 with core 51 formed of an additive, protected by a casing 52 of carbohydrates.

Figure 7 shows a capsule 55 with a core 56 holding a few additives such as 57 and 58, also encapsulated, protected by a casing 59.

Figure 8 shows an irregularly shaped capsule 70 formed of a granule 71 of sugar impregnated with additive 72 and protected by a casing 73 of carbohydrates.

The sugar can be replaced by an artificial sweetener or by a mixture of both, such as aspartame, saccharose or acesulfame K with fructose, lactose or sorbitol.

As is well known, the liposoms are minute balls of phospho-lipids of lecithin of soya, comprising an outer hydrophile membrane, an inner water-resistant membrane that retains oily substances, and an internal cavity for retention of hydrophile molecules.

They can thus simultaneously encapsulate water and fats, and therefore non-alcoholic natural essences.

Figure 9 shows a machine 80 for dry encapsulation of additives by means of liposoms of lecithin of soya. This machine 80, standing on floor-based supports 81, comprises the shaft 83 freely turning, by kinematic connection to the gears 84, 85, on power from the electric motor 86 supported by the bracket 82.

This shaft 83 carries a series of groups 87 of blades (Figures 9-12).

The horizontal container 90 rotates, freely but slowly, round said shaft 83.

Said container 90 is made to rotate by pulleys 91 and 92, respectively fixed to one side of the container and to the shaft of the electric motor 95 on floor-based supports 94.

The pulleys are connected by a continuous belt 93.

The container 90 rotates at a speed of a few turns per minute in the direction opposite to that of the faster shaft 83.

The tank 100 containing a dry mixture of polysaccharides communicates with the inside of the container 90 through the connecting means 101.

The pressurised apparatus 105 is joined to the tank 100 through a tube 106.

A mixture of liposoms and malt dextrin is put into the container 90, together with liquid additives to be encapsulated, all this forming a fluid paste

Rotation of both container 90 and shaft 83 is begun while, through the connecting means 101, the dry mxture 102 of polysaccharides enters the container 90 through the nozzles 107 on the collector-distributor 108.

Due to rotation of the container 90, the mixture 103 (Figure 10) of liposoms, malt dextrin and polysaccharides tends to solidify in lumps. The sets of blades 87, which rotate in the opposite direction, transform the lumps into increasingly smaller balls 104 and 110 with cores 111 protected by the shell 112 of carbohydrates with thousands of liposoms 115 (see Figures 12 and 13).

Figure 14 is a conventional illustration of one liposom 115 that comprises, from the inside outwards, the mass of water 116 surrounded by the oily fraction 117 with the hydrophile shell 118 around that.

A suitable package for the individual portion is the packet 170 shown in Figures 22-26, consisting (Figure 15) of an inner sheet 130 of polythene over an intermediate metal sheet 131 and an outer one of paper 132.

Several packets can be made up simultaneously 180-182, placed side by side to form a strip (Figures 19-21).

Figure 16 shows a packaging machine 120 comprising vertical supports 121 at the side, and a set of horizontal devices as described here below.

Each set of the batching devices 125 comprises a substantially cylindrical body 126 (Figure 17) within which is a cross-shaped batcher 127, an initial channel 128 and an ultimate channel 129.

The initial channel 128 is fed with the mixture to be made up 135 comprising capsules 36 of additives and supporting components 136.

Visible inside the ultimate channel 129 is the individual portion 140 that, on leaving said channel, enters the chamber formed by the multi-composition sheets 141, 142, already seen in Figure 15.

As shown in Figure 16, downstream of the set of batching devices 125, there is a set of rollers 145 in pairs for vertical longitudinal welds between one packet and another laid side by side.

Cut into these rollers (see detail in Figure 18) are notches 146 and 147 in the same radial position and opposite each other.

On passing between said pairs of rollers 145 each packet in the strip of filled packets is given a vertical longitudinal weld 171, (see Figure 22) where the passages 172 for expulsion of air are shown up.

Immediately below the pairs of rollers 145 is the pair of rollers 150 (Figures 18 and 23) for the crosswise welds 175 and 176 and for making a cut at the start of the upper packets during filling and at the end of the lower filled packets respectively.

As shown in Figure 18, these rollers 150 present blades 153, of a triangular section, and opposing blades 151 which, on matching, make the crosswise cut between the lower packets and the following upper ones.

Immediately after said pair 150 of welding and cutting rollers, is a set of circular blades 155, 156, longitudinal and therefore crosswise to the horizontal strips of packets placed side by side, that separate the packets into groups, like 180, 181 and 182.

Below said blades 155, 156 is a set of pressing rollers 160.

These flatten the packets and at the same time completely expel the air inside them.

Immediately beyond is the pair 165 of rollers for longitudinal welds that give a final seal 177 to the packets by closing the passages 172 (Figures 23, 24).

Figure 25 shows a packet 185 of a rectangular section ready for use.

Figure 26 shows a square packet 186.

Figures 27 and 28 show a blister pack 187 of six individual portions, like 188 and 189.

Figures 29-31 show an individual portion 190 packaged in a plastic cup 191 with a tear-off lid 192 on the top.

Figure 32 shows these cups 191 associated in a blister pack 193.

Figure 33 shows packaging 195 of an individual portion in the form of a lump 196, using three layers of material – polythene, metal and paper – wrapped round the lump, the ends being then folded over at one end of the lump and made to form a twist 197 at the other end.

Figure 34 shows a type of packaging of a lump 199, similar to the previous one, with the layers of material wrapped round it and made to form two twists 201, one at each end.

Figure 35 shows packaging in a packet 205 having inside it a small tube 206 containing an individual portion 207, with a pull-off top 208, also seen in Figures 36, 37.

The shaped part 209 is to be used as a spoon.

Figure 38 shows the use of the tube-shaped packing 206 when the portion 207 is being poured into the cup 210.

In Figure 39 the tube 206 is shown when its end is being used as a spoon to mix the individual portion into the contents 211 of the cup.

CLAIMS

1. Process and machinery for production (10, 40, 80) and packaging of (120) soluble individual portions for improving beverages (211) and raw or cooked foods in general, at the moment of consumption, characterized in that said individual portions (140, 190, 196, 199, 207) comprise additive components (33, 37, 51, 57, 58, 72) in granules for spicing, flavouring, colouring, energising, vitaminising, pain-easing providing salt substances and supplements in general, supporting components (136) and means of protection (170, 180-182, 185, 186, 188, 189, 191, 195, 198, 205, 206) for the active principles of said additives (33, 37, 51, 57, 58, 72).

2. Process and machinery as in claim 1, characterized in that the supporting components (136) are sweeteners, salts, fibres, dehydrated foods and freeze-dried foods.

3. Process and machinery as in claim 1, characterized in that the supporting components (136) are in granules made physically homogeneous, in their granulation, size and density, with the additives (33, 37, 51, 57, 58, 72).

4. Process and machinery as in claim 2, characterized in that the sweeteners are carbohydrates.

5. Process and machinery as in claim 2, characterized in that the sweeteners are associated to products derived from the Stevia Rebaudiana Bertoni plant.

6. Process and machinery as in claim 2, characterized in that the sweeteners are associated to products derived from liquorice root.

7. Process and machinery as in claim 2, characterized in that the sweeteners (136) are artificial.

8. Process and machinery as in claims 1 and 2, characterized in that the individual portion (140, 190, 196, 199, 207) weighs between two and fifteen grams if the sweeteners (136) are

natural and caloric and up to five grams if the sweeteners (136) are non-caloric.

9. Process and machinery as in claim 1,

characterized in that the additives (33, 37, 51, 57, 58, 72) are protected by encapsulation of their particles of active principles in capsules (35, 50, 55, 70, 110).

10. Process and machinery as in claim 9,

characterized in that the particles of active principles of the additives (37) are encapsulated in capsules (35) by incorporating them, after extremely fine homogenization, in a mixture of carbohy-drates the molecular structure of which has been made amorphous, and by subsequent extrusion of the compound (25) obtained.

11. Process and machinery as in claim 9,

characterized in that encapsulation of the particles of active principles of the additives (37) comprises the following stages:

- introduction of a crystalline mixture of granular carbohydrates into a boiler, these being chosen from among those whose temperature of transition, namely the temperature at which the carbohydrates pass from a crystalline to an amorphous state, is as low and as even as possible;
- transformation of the crystalline mixture of carbohydrates into an amorphous mass by heating and addition of plasticizing liquids;
- addition of minutely dispersed additives (37) through atomizing nozzles (107);
- rapid cooling of the compound (25);
- introduction of the compound (25) into the chamber (12) of an extruder (10);
- extrusion of the compound (25);
- cutting the extruded threads (30) into sticks (32) of a length the same as that of the granule of carbohydrates used;
- washing (40) the sticks (32) with a nebulizer (41);

- drying the sticks to a moisture of 2-5% forming capsules (35).

12. Process and machinery as in claims 10 and 11, characterized in that, during extrusion, the shape given to the capsules (35) of additive (37) is one with sharp edges (36).

13. Process and machinery as in claim 9, characterized in that the particles of active principles of the additives in capsules (50) are encapsulated by centifugation of a compound comprising water, liquid fractions of the additives and a mixture of soluble substances, excess moisture being removed by a draught of warm air.

14. Process and machinery as in claim 13, characterized in that the soluble substances consist of carbohydrates, with a prevalence of starches and glucids.

15. Process and machinery as in claim 13, characterized in that the soluble substances consist of jellies.

16. Process and machinery as in claim 13, characterized in that the soluble substances consist of gum arabic.

17. Process and machinery as in claim 9, characterized in that encapsulation in capsules (70) of the particles of active principles of the additives (72) is obtained by formation, on granules of sugar (71) impregnated with the additive (72), by means of atomization, of a soluble protective shell of carbohydrates (73).

18. Process and machinery as in claim 17, characterized in that the protective shell (73) comprises natural sweeteners.

19. Process and machinery as in claim 17, characterized in that the protective shell (73) comprises artificial sweeteners.

20. Process and machinery as in claim 17, characterized in that the protective shell (73) comprises a mixture of natural and artificial sweeteners.

21. Process and machinery as in claim 9,
characterized in that encapsulation in capsules (110) of the particles of active principles of the additives is done dry by means of liposoms of lecithin of soya.

22. Process and machinery as in claim 21,
characterized in that encapsulation in capsules (110) of the particles of active principles of the additives by means of liposoms of lecithin of soya comprises saturation, at room temperature, of a first fluid mixture of additives, liposoms (103) and carbohydrates prevailingly malt dextrin, and the addition to said fluid mixture of a second mixture, in a dry state, of carbohydrates, prevailingly dextrose and starches, in a machine (80) comprising a horizontal cylindrical container (90) inside which, on its geometrical axis, there is a shaft (83) with orthogonal blades (87), said cylindrical container (90) rotating slowly at a speed of a few turns per minute round the shaft (83) while said shaft (83) rotates faster, in the opposite direction,
in that encapsulation is carried out in the following stages:

- introduction into the container (90) of the first fluid mixture;
- introduction into the moving fluid mixture, by means of an atomizer, of the second mixture (102) in the dry state;
- continuous grinding by the blades (87) of the lumps (104) which tend to form in the compound (103) of the two mixtures until, due to the effects of rotation and of reciprocal friction among the lumps (104), formation is achieved of macrocapsules (110) of liposoms (115) of an increasingly spherical shape;
- drying of the macrocapsules (110) in a draught of air;
- calibration of the macrocapsules (110) using a sieve.

23. Process and machinery as in claim 1,
characterized in that protection of the active principles of the additives is obtained by packaging (170, 180-182, 185, 186, 187, 191, 195, 198, 205, 206).

24. Process and machinery as in claim 23,
characterized in that the packagings (170, 180, 181, 182, 185, 186, 187, 191, 195, 198, 205, 206) present shapes, colouring wording, indications according to the components of the individual portion (140, 190, 196, 199, 207).

25. Process and machinery as in claim 23,
characterized in that the packagings (170, 180-182, 185, 186, 187, 191, 195, 198, 205, 206) are obtained by wrapping the individual portion (140, 190, 196, 199, 207) in a multi-composition wrapping (141) comprising an internal sheet (130) of polythene, an intermediate one (131) of micrometric thickness of non-elastic metal and an external sheet (132) of paper.

26. Process and machinery as in claim 1,
characterized in that the individual portion (140, 190, 207) is in granules.

27. Process and machinery as in claims 25 and 26,
characterized in that the packages consist of sealed packets (170, 180, 182, 185, 186).

28. Process and machinery as in claim 27,
characterized in that packaging in a sealed packet (170, 180-182, 185, 186) is done in a packaging machine (120).

29. Process and machinery as in claim 28,
characterized in that, once the packet (170, 180-182) has been filled, the packaging machine (120) flattens it by expelling the air inside through channels (172) for the purpose, subsequently closed.

30. Process and machinery as in claim 28,
characterized in that the packaging machine (120) can simultaneously package several packets (180-182) associated laterally to form a strip comprising the two walls of the packets, and comprises:

- a set of laterally aligned batching devices (125) for the product (140) subject of the process;

- a pair of opposingly-situated heated rollers (145) for the longitudinal weld (171) on the packats (170, 180-182) leaving crosswise channels (172) for expulsion of air;
- a pair of opposingly-situated heated rollers (150) for the crosswise weld (175) and for cutting the lower edge of the packet being filled, and the upper edge of the preceding filled packet;
- a pair of shafts with longitudinal circular blades (155, 156) for separating the laterally aligned packets (180-182) forming a strip;
- a pair of opposingly-situated pressure rollers (160) for flattening the filled packets (170, 180-182) expelling the air inside them;
- a pair of opposingly-situated heated rollers (165) for welding a longitudinal seal on the crosswise channels (172) through which the air in the packets (170, 180-182) has been expelled.

31. Process and machinery as in claim 1,
characterized in that the individual portion (190) is introduced into a small disposable cup (191), blister packaged (193).

32. Process and machinery as in claim 1,
characterized in that the individual portion (207) is introduced into a tube (206) with a tear-off lid (208) fitted with a tongue, and with a base (209) shaped to function like a spoon.

33. Process and machinery as in claim 1,
characterized in that the individual portion is in the form of a lump (196, 199).

34. Process and machinery as in claims 23 and 33,
characterized in that individual packaging (195) consists of a sheet wrapped round the lump (196) the ends at one end being folded over onto each other and, at the other end, turned to form a twist (197).

35. Process and machinery as in claims 23 and 33,
characterized in that individual packaging (198) consists of a sheet wrapped round the lump (199) both ends turned to form two twists (201), one at each end.

36. Process and machinery as in claim 9,
characterized in that the additives intended to reach the stomach are encapsulated in microcapsules of micrometric or nanometric dimensions with a shell soluble in an acid pH, enclosed in a larger capsule, whose shell is soluble in the beverages, that comprises the additive intended to improve said beverages, so that said larger capsule, together with the additive it contains, becomes dissolved in the beverage while the microcapsules swallowed, dissolving on contact with the gastric juices, free the active principles of the additives contained in said microcapsules.

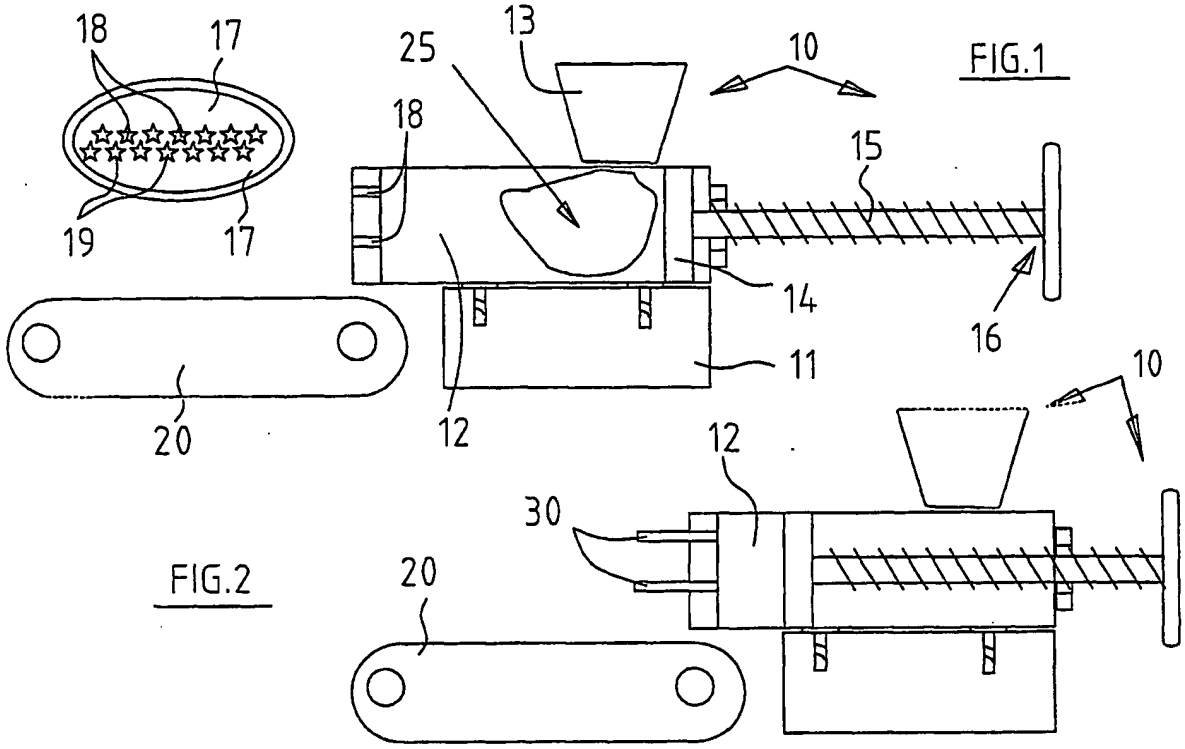



FIG.1

FIG.2

FIG.3

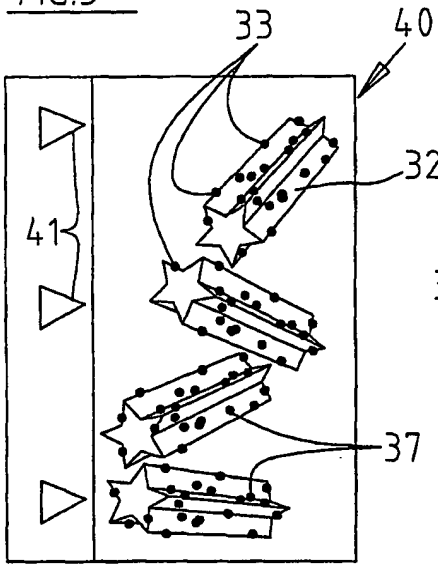



FIG.4

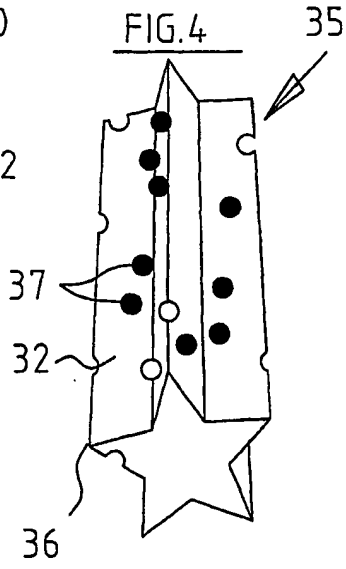
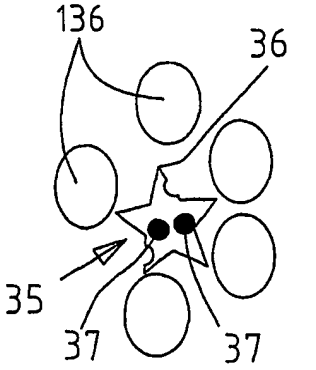



FIG.5



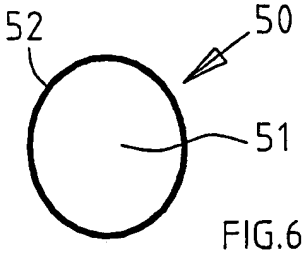




FIG.6

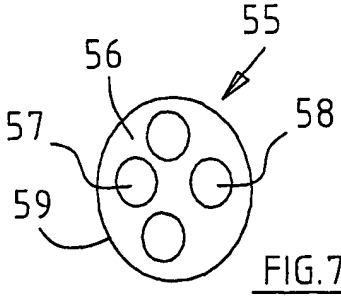



FIG.7

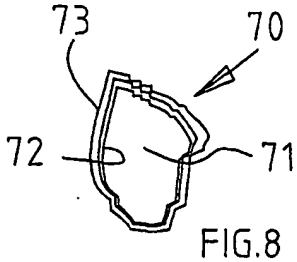



FIG.8

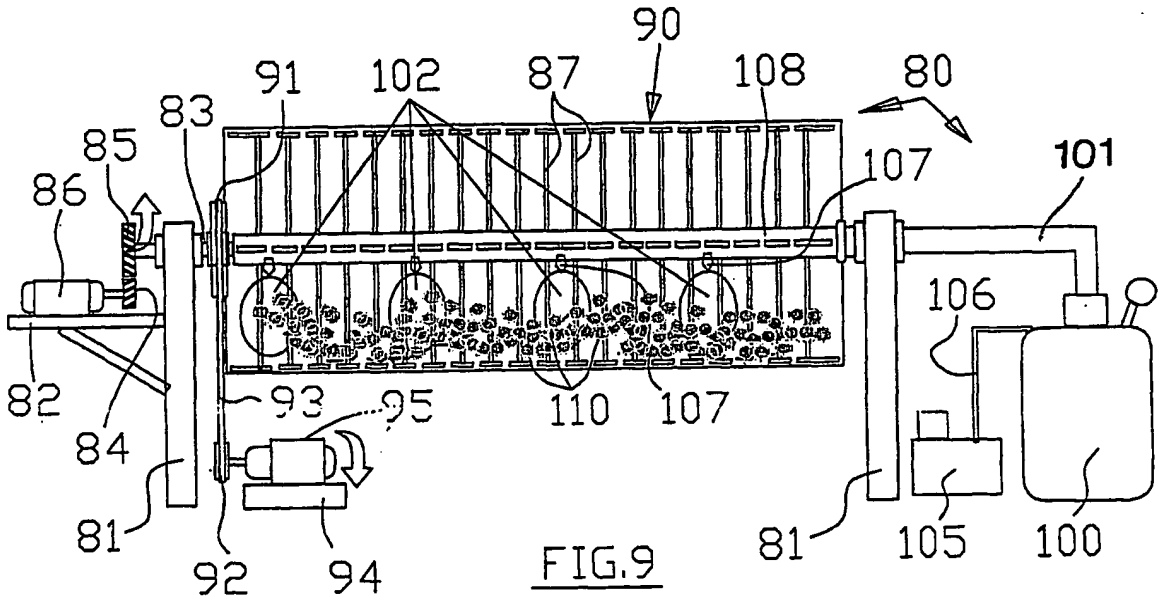



FIG.9

FIG.10

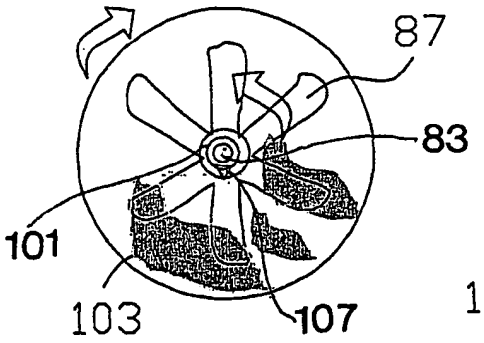



FIG.11

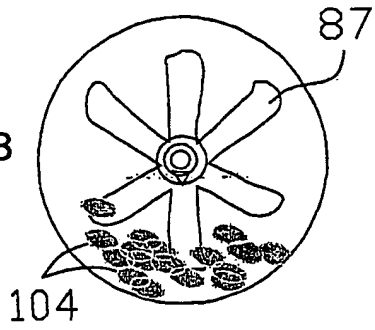
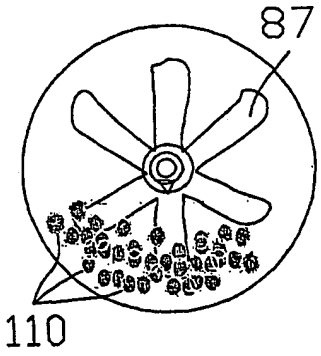



FIG.12



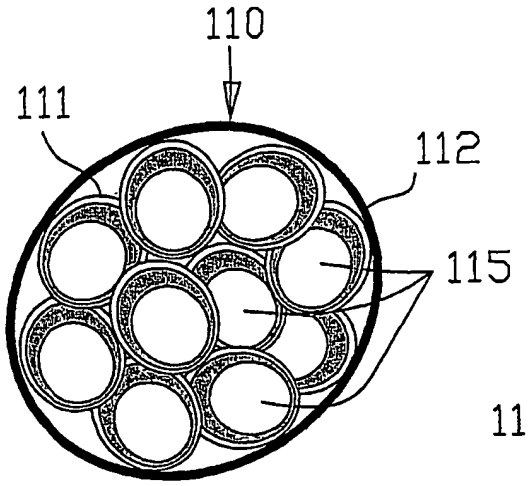




FIG.13

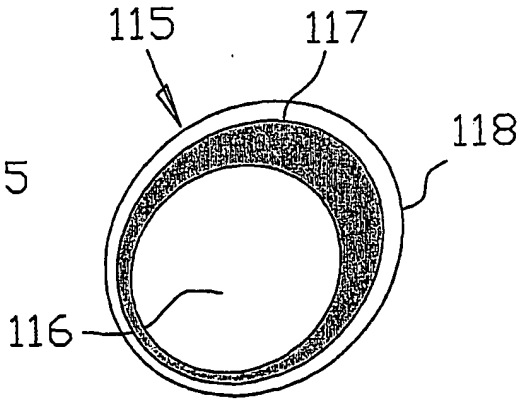



FIG.14

FIG.15

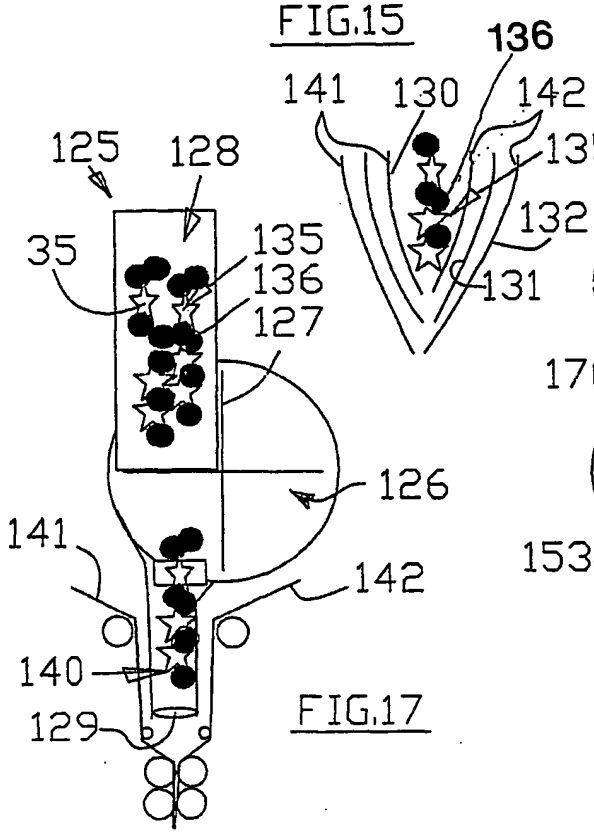



FIG.17

FIG.18

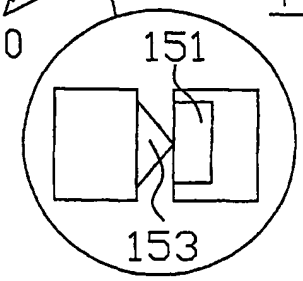



FIG.16

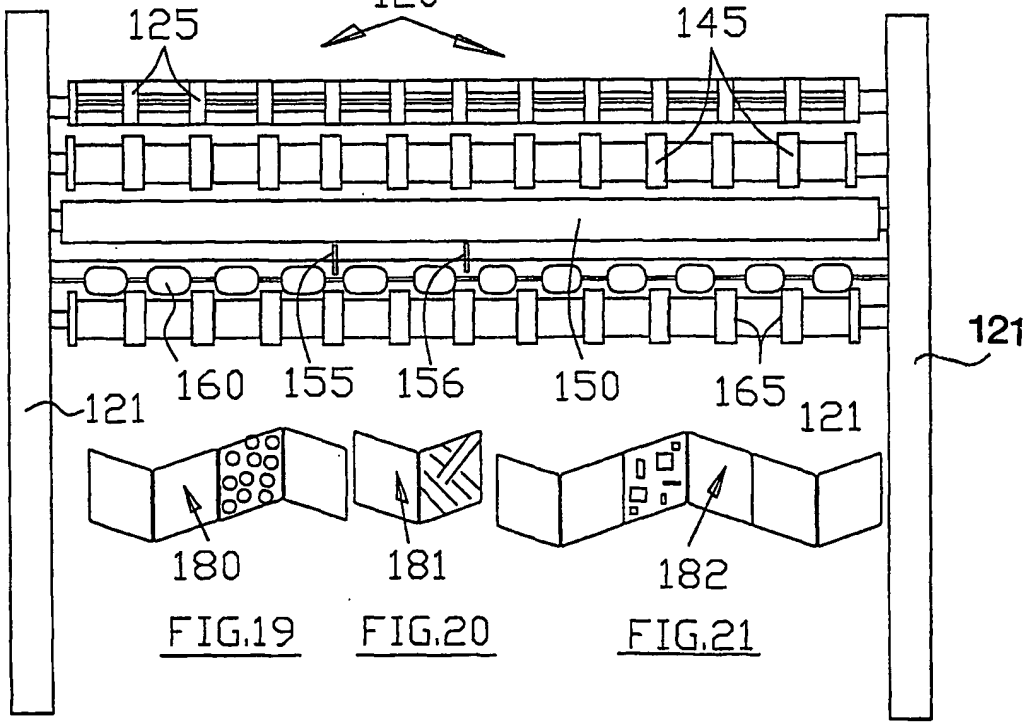









FIG.19 FIG.20 FIG.21

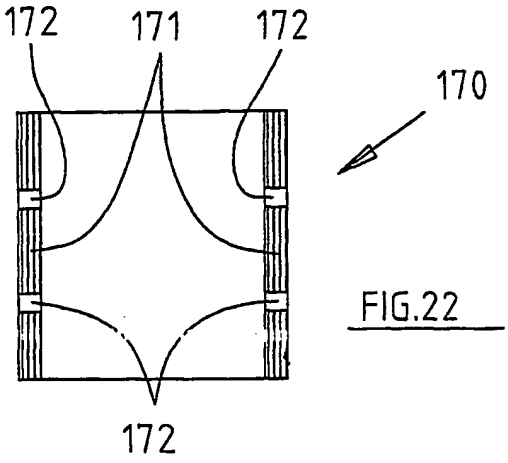



FIG.22

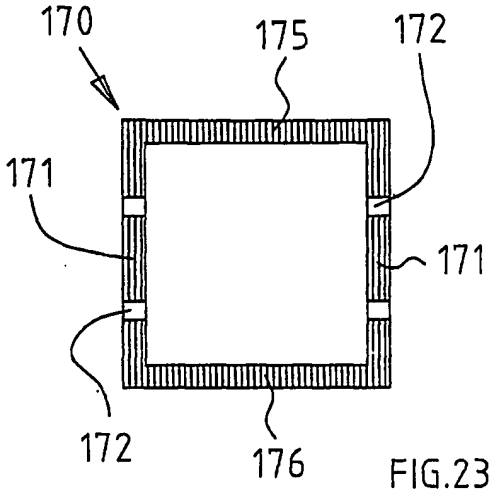



FIG.23

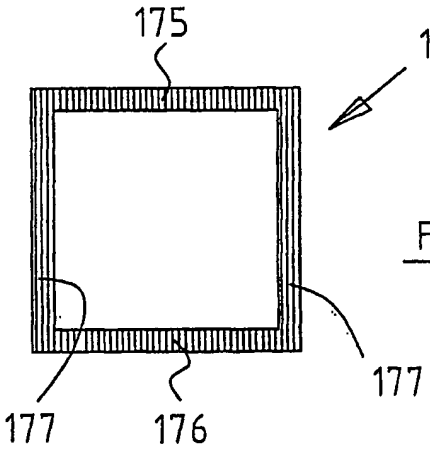



FIG.24

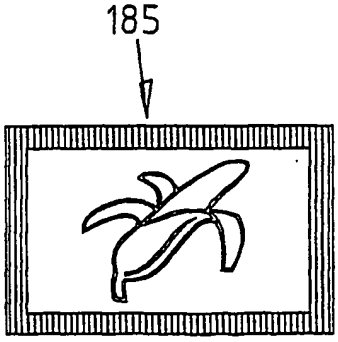



FIG.25

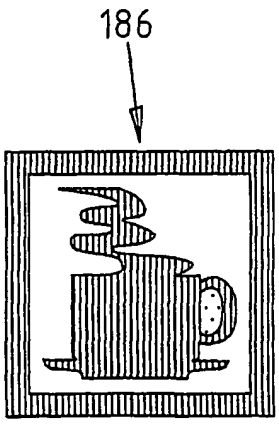



FIG.26

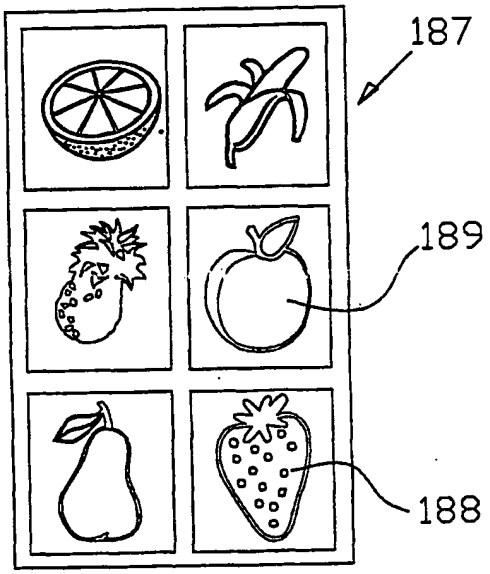



FIG.27

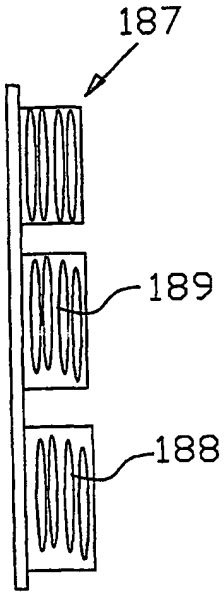



FIG.28

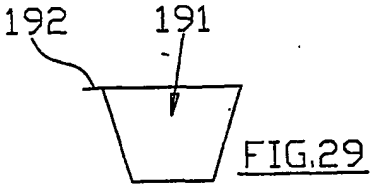



FIG.29

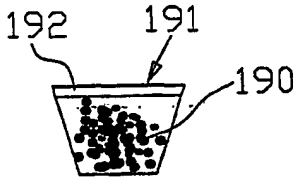



FIG.31

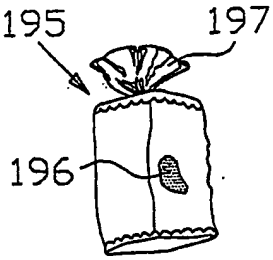



FIG.33

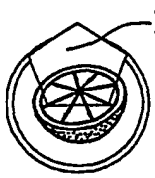



FIG.30

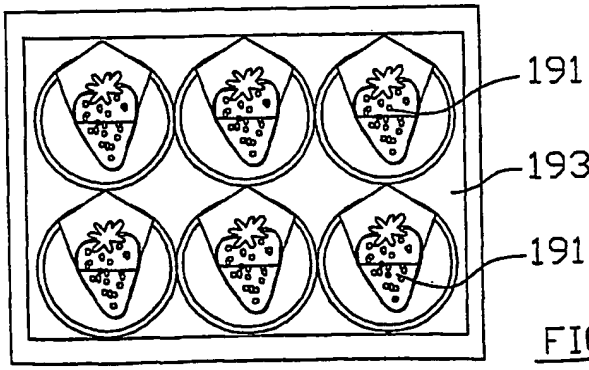



FIG.32

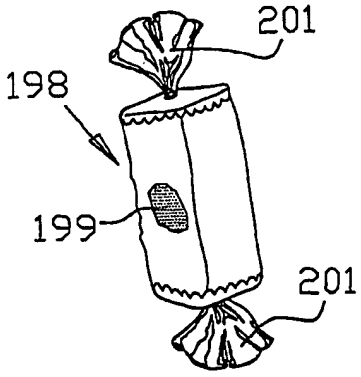



FIG.34

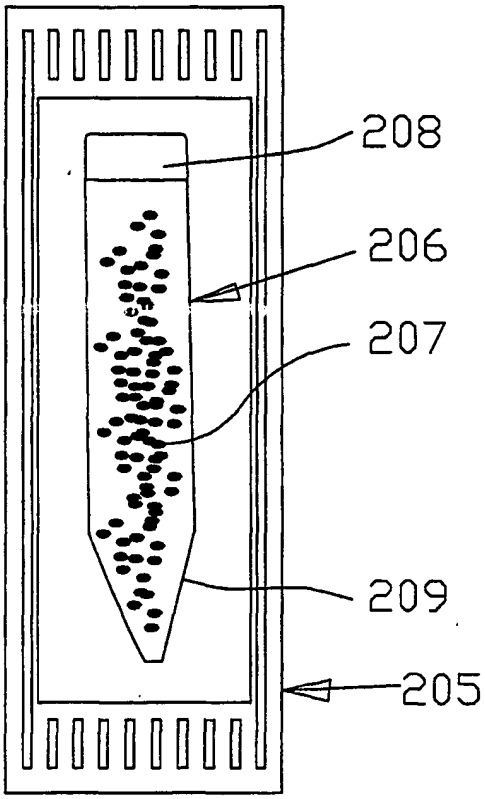



FIG.35

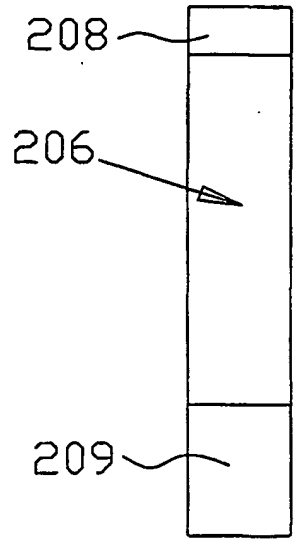



FIG.36

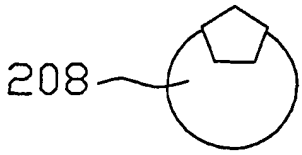



FIG.37

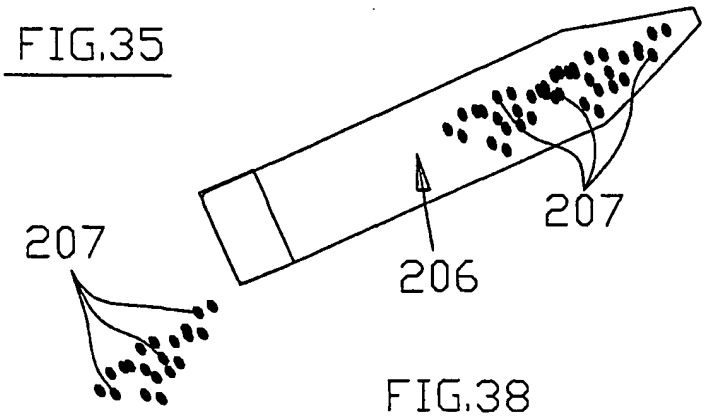
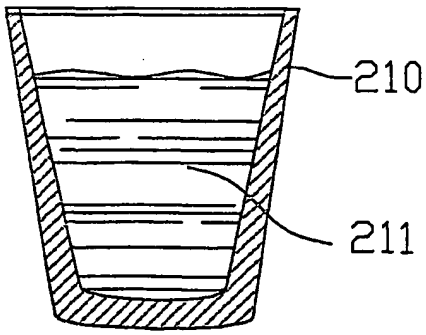



FIG.38



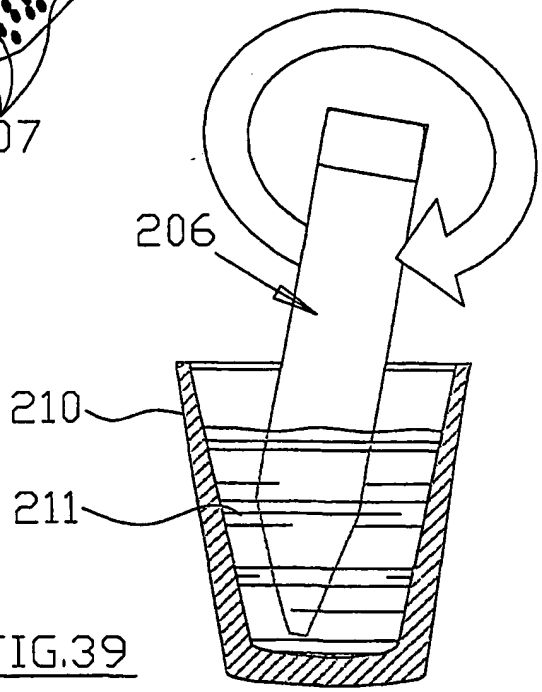




FIG.39

# INTERNATIONAL SEARCH REPORT

Int ··· nal Application No
PC··/··T 01/00148

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23L1/22 A23L2/395 A23G3/00 C13F3/00 C13H1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A23L A23G C13F A23P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
FSTA, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | WO 99 25879 A (B MA SNC DI CAFANO GIUSEPPE E ;CAFANO GIUSEPPE (IT); CAFANO RAFFAE) 27 May 1999 (1999-05-27)<br>page 4, line 6 - line 11<br>page 8, line 21 -page 9, line 3; figures 17-23<br>claims 1-17,22-39 | 1-4,7-9, 17-20, 23,24, 26-30, 33-35 |
| X,Y | FR 1 442 282 A (DEREGNAUCOURT) 21 September 1966 (1966-09-21)<br>the whole document | 1-4,9, 23,33 |
| X,Y | FR 90 535 E (DEREGNAUCOURT) 21 March 1968 (1968-03-21)<br>the whole document | 1-4,9, 23,33 |

-/--

[X] Further documents are listed in the continuation of box C. [X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 19 November 2001 | 28/11/2001 |

| Name and mailing address of the ISA | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31–70) 340–2040, Tx. 31 651 epo nl,<br>Fax: (+31–70) 340–3016 | Lepretre, F |

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# INTERNATIONAL SEARCH REPORT

International Application No
P.., IT 01/00148

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 3 607 310 A (CARTER JAMES F JR)<br>21 September 1971 (1971-09-21)<br>column 4, line 7 - line 18<br>column 4, line 53 -column 5, line 75<br>column 6, line 1 - line 36; claims | 1-4,9,10 |
| A | FR 2 435 916 A (GEN FOODS CORP)<br>11 April 1980 (1980-04-11) | |
| A | WO 00 25606 A (BENCZEDI DANIEL ;FIRMENICH & CIE (CH); BOUQUERAND PIERRE ETIENNE ()<br>11 May 2000 (2000-05-11)<br>claims | 10,11 |
| A | FR 2 204 190 A (BECK EUGENE)<br>17 May 1974 (1974-05-17) | |
| A | DE 296 20 427 U (STEIN ROLF ;HENNING WILFRIED DIPL ING (DE))<br>3 July 1997 (1997-07-03) | |

# INTERNATIONAL SEARCH REPORT

International Application No
PCT/FR 01/00148

| Patent document cited in search report | | Publication date | Patent family member(s) | | Publication date |
|---|---|---|---|---|---|
| WO 9925879 | A | 27-05-1999 | IT | MI972556 A1 | 18-05-1999 |
| | | | AU | 5135398 A | 07-06-1999 |
| | | | EP | 1032712 A1 | 06-09-2000 |
| | | | WO | 9925879 A1 | 27-05-1999 |
| | | | TR | 200001462 T2 | 21-09-2000 |
| FR 1442282 | A | 21-09-1966 | NONE | | |
| FR 90535 | E | 21-03-1968 | NONE | | |
| US 3607310 | A | 21-09-1971 | CH | 523665 A | 15-06-1972 |
| | | | DE | 1692598 A1 | 05-01-1972 |
| | | | FR | 1539071 A | |
| | | | GB | 1196971 A | 01-07-1970 |
| | | | IT | 1029504 B | 20-03-1979 |
| | | | NL | 6710535 A | 30-01-1968 |
| FR 2435916 | A | 11-04-1980 | FR | 2435916 A1 | 11-04-1980 |
| WO 0025606 | A | 11-05-2000 | BR | 9915007 A | 07-08-2001 |
| | | | EP | 1124443 A1 | 22-08-2001 |
| | | | WO | 0025606 A1 | 11-05-2000 |
| | | | US | 2001038879 A1 | 08-11-2001 |
| FR 2204190 | A | 17-05-1974 | FR | 2204190 A5 | 17-05-1974 |
| DE 29620427 | U | 03-07-1997 | DE | 29620427 U1 | 03-07-1997 |